zoögeographical point of view, by Professor Studer (Berne); On the progress of our knowledge of Sumatra, by Professor Kan (Amsterdam); On the alleged influence of the earth's rotation upon the formation of river-beds, by Professor Zöppritz (Konigsberg); On the colonies of Germans and their neighbors in Western Europe, by Herr Meitzen (Berlin); On the historical development of geographical instruction, by Dr. Kropatschek (Brandenburg); On the treatment of subjects relating to conveyance in geographical instruction, by Professor Paulitschke (Vienna); On the introduction of metrical measures in geographical instruction, by Professor Wagner (Göttingen); On the relation between anthropology and ethnology, by Professor Gerland (Strassburg); On the ethnological conditions of Northern Africa, by Dr. Nachtigal (Berlin); On the Polar question, by Professor Neumayer (Hamburg); On the geographical distribution of Alpine lakes, by Professor Credner (Greifswald); On the true definition of the development of coasts, by Professor Günther (Ansbach); On geographical instruction in its relation to natural sciences, by Professor Schwalbe (Berlin); On the Guldberg-Mohn theory of horizontal air currents, by Professor Overbeck (Halle); On the systematic furtherance of the scientific topography of Germany, by Herr Lehmann (Halle).

MICROSCOPY.[1]

MICRO-CHEMISTRY.—In a paper by H. Reinsch on the detection and separation of certain minerals under the microscope, it is claimed that the use of the microscope in chemical analysis is not only rapidly increasing, but that it is approaching the spectroscope and in some respects surpassing it in usefulness. It is admitted, however, that great skill is required in manipulation, and in preparing test objects to verify results, as appearances vary according to the degree of concentration of the solutions used, and different reactions will sometimes be obtained from the same salt. The following are some of the more interesting experiments, as translated in the *Scientific American Supplement.*

"Silica, of all substances, yields the most varied and beautiful forms, resembling plants and ferns, often presenting, in the most glowing colors, five-leaved flower forms in infinite varieties. To obtain these forms, we place a drop of a four per cent. solution of potassium silicate on an object slide, and then add a drop of a two per cent. solution of sodium bicarbonate, and then allow the liquid to evaporate at the ordinary temperature; after a few hours have elapsed the most beautiful flower forms will be found spread over the slide, and will be readily recognized by a pocket lense, but when examined by the microscope with the Nicol at 90°, will exhibit the crystals gleaming with a most magnificent play of colors. By moistening the object with a drop of copal varnish, and covering it with a thin glass, these forms may be permanently

[1] This department is edited by Dr. R. H. WARD, Troy, N. Y.

preserved. If we mix a drop of the four per cent. solution of the silica solution with a drop of the one per cent. sodium bicarbonate solution, we fail to obtain any plant forms, but find polarized spheres, which, when the Nicol prism is at 90°, exhibit a dark cross, just such as are obtained with calcspar; on further turning of the prism it seemed to revolve visibly, and at 0° almost entirely disappears or passes over into a green cross. The most minute traces of silica can, by this means, be readily detected in a mineral, by melting a small sample of the substance with a little potassium hydrate and dissolving it in a little water, and then placing a clear drop of the solution on an object slide in the manner previously indicated.

It is just as easy to microscopically determine aluminum oxide as it was to detect the silica. It may be recognized as well from its sulphates as from its alkali solutions. If we place a drop of a four per cent. solution on an object slide and allow it to evaporate, spherical crystals will be obtained, which, turning at 90°, show a white cross formed of pencils of rays; if we cover the object with a mica plate, and place the Nicol at 0°, the rays of the little spheres appear as if composed of a number of small black grains; placing it at at 60°, they appear as two blue rays opposite to each other, which at 90° assume a corresponding position, and on further turning of the prism disappear entirely. If we mix a saturated aluminum oxide solution in potassium hydrate with sufficient water to produce a two per cent. solution, and place a drop or two of it on the slide, then mix the sample with a drop of a one per cent. solution of sodium bicarbonate, after evaporation, there will remain a dull white spot, which when still moist shows peculiar spheres; by means of these alumina can easily and positively be distinguished from silica; for they appear when the prism is at 90° as a white cross whose diagonal axis ends in two round or rhombic scales. If we mix the alkali solution of silica and aluminum oxide with a drop of sodium bicarbonate solution, the silica will appear as silvery, partly closed dendrites, while the alumina assumes lengthy forms which, when covered with a mica plate, seems blue, while the dendrites of silica are seldom colored.

Glucina may be very easily distinguished microscopically from both of the preceding earths. A drop of a four per cent. solution of glucium sulphate when evaporated on the slide leaves large stars, which may be detected by the naked eye; whose fern-like leaves spread themselves over the entire surface of the drop. The star in the center, when the prism is at 90°, exhibits prismatic colors, the leaves appear of a dull silver white or brownish color, and they are often perforated.

Boric acids is likewise very easy to detect, for from its two per cent. aqueous solution there is obtained, after evaporation, a series of very small plates hardly 2 mm. in diameter, which, when they are magnified 80 times, do not show any cross. If the residue of

the boric acid be moistened with a drop of the two per cent. solution of sodium bicarbonate, the dried drop will be found to consist of beautiful polarizing spheres, which in their center inclose a small white cross; this on turning the Nicol prism also revolves. Occasionally dendritic stars instead of the spheres are formed.

The alkalies possess such optic properties that they can be definitely and certainly distinguished by the microscope. In making these tests it is best to employ the sulphates for the examination, as they are the most constant in their composition, and in the drying the samples will not absorb moisture from the air and so produce forms which may readily be recognized. Four per cent. solutions were made of the alkalies soluble in water.

The test with potassium sulphate gives, at 0° of the Nicol, a series of rhombic plates, which are not very well defined; at 90° blue rims with yellow or red spots are developed; these cannot be taken for any other alkali.

Sodium sulphate will be recognized just so soon as it becomes dry by its percipitation. In the darker field of the microscope it appears dull, and silvery-white in hopper-shaped quadratic crystals.

The ammonium sulphate assumes such peculiar shapes that it cannot be mistaken for any other salt. At 0° the crystals are hardly recognizable; at 90° they appear like partly decomposed walls built of gray blocks, with blue and brown rims.

Lithium sulphate forms clusters of prismatic needles which at 0° show beautiful colors and a blue cross, which at 90° becomes black. The most minute quantities of lithia can be recognized by their optical behavior.

Lime may be detected in several different ways: if a drop of a two per cent. solution of calcium chloride is mixed with a drop of a one per cent. sodium bicarbonate solution, the drop will become cloudy, and after drying it appears white and shows distinct dendritic stars which consist of an accumulation of small crystals. Barium and strontium salts fail to show this reaction, or only in a very indistinct manner. Lime is best recognized under the microscope when it is in the form of the sulphate, and is prepared by mixing a drop of a soluble lime salt with a drop of sodium sulphate. The sulphate crystallizes in stellar-shaped crystals, which cannot readily be mistaken for any other forms.

Barium nitrate assumes mossy, glistening like silver, colorless dendritic forms; while strontium nitrate takes the form of radiating needles, which are bluish at 0°, and at 90° are blue, green, and red.

Magnesia may, even when present in the most minute quantities, be detected by the microscope. The sulphate forms colorless clusters of needles, which do not become colored even at 90°.

The copper sulphate takes the form of step-like prisms, which

at 0° are almost colorless, becoming at 70° light blue with green stripes, and at 90° show brilliant colors.

The four per cent. solution of manganese sulphate shows broad scales, silver white to gray in color, and which are partly serrated at 0°, as well as at 60° and 90°. If the sample is left by itself for several days, polarizing spheres will appear; these are so peculiar that the manganese can readily be recognized from them, especially as no other metal forms such spheres.

Cadmium presents the most characteristic formations of all the metals; a four per cent. solution of the sulphate produces large spheres containing ellipsoids, which radiate from the center and are marked by regular transverse depressions. This formation can be recognized without a Nicol's prism, and therefore it is not the result of the polarized light, but evidently depends upon the mechanical arrangement of the crystals. On using the Nicol the spheres show at 0° a beautiful blue or green cross, whose color zones increase with the turning of the prism until 90° is reached, when the most beautiful colors of the rainbow are manifested, while the ellipsoid becomes darker, better defined, and the transverse depressions are marked by dark spots. These phenomena become still more characteristic when observed over a plate of mica. From more dilute solutions of the cadmium sulphate, it is possible to obtain the spheres, but the peculiar structure is not observed.

If a two per cent. solution of iron sulphate be mixed with a one per cent. solution of sodium bicarbonate, the drop soon becomes cloudy, and is covered with a gold lustrous film of the oxide; after drying the specimen shows no spheres, but if it is allowed to remain quiet for two days, small crystals of iron carbonate are formed; these show the phenomena of polarization distinctly, but in a very peculiar manner.

Uranium sulphate assumes the most beautiful forms of all the metals; a four per cent. solution is taken, and at least twelve hours are necessary to produce the desired formation. It can readily be recognized with a pocket lens, and resembles beautifully colored asters or corn-flowers. Less frequently it occurs in the form of envelopes with velvet-blue, narrow, and purple-colored broad triangles, which may also be recognized without the Nicol, and therefore are not produced by polarized light but result from the mechanical arrangement of the crystals.

The mercuric sulphate is difficultly soluble, but it can easily be brought into solution by the addition of a few drops of nitric acid. It forms figures similar in shape to a Maltese cross, of superimposed scales, which are very unstable.

Silver may easily be determined, and in such a way that it is not easily mistaken for any other metal. A drop of a two per cent. solution of silver sulphate deposits bright points which may be detected with the naked eye; at 0° these appear as complete

rhombic octahedrons, with the edges cut off; at 90° they glisten with the most beautiful play of colors, like the diamond; at times groups are formed which seem exactly like a set of diamond jewelry.

Protector for Objectives.—A very convenient and useful contrivance for covering the front surface of an objective, and thereby protecting it from injury from corrosive fluids or gases, and also for enabling the objective to be plunged directly into water so that different layers of the liquid may be rapidly examined for microscopic constituents, or sediments at the bottom examined *in situ*, is made by T. H. McAllister, of 49 Nassau street, New York. Fig. 1 gives an external view of the instrument, and Fig. 2 shows it in section as applied to an objective. It is made of brass and closed at the lower end with a thin cover glass. It is applicable to any objective of sufficiently narrow mounting and long working focus, and it works well with powers from a $1\frac{1}{2}$ inch to a low-angled $\frac{1}{4}$th or $\frac{1}{5}$th.

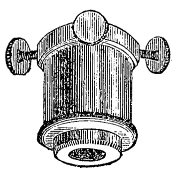

Fig. 1.

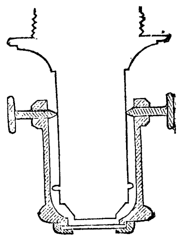

Fig. 2.

Living Objects for the Microscope.—Living specimens of animals and plants are supplied, for microscopical study, by A. D. Balen, of Plainfield, N. J. Single packages are sent by mail for 30 cents, or contracts made for a weekly supply, throughout the season, at a still lower rate.

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SCIENTIFIC NEWS.

— At a meeting of the New England Historic Genealogical Society, held April 5th, Dr. William Barrows read the following memorial to Congress:

"To the Honorable the Senate of the United States:—Your petitioners, the members of the New England Historic Genealogical Society, would respectively represent that there are in the Territories of New Mexico and Arizona twenty-six towns of the Pueblo Indians, so called, in all containing about ten thousand inhabitants; that the number of their towns was once very much greater; that those remaining are the remnant of very ancient races in North America whose origin and history lie yet unknown in their decayed and decaying antiquities; that many of the towns have been abandoned by the decay and extinction of their inhabitants; that many of these relics have already perished, and so made the study of American ethnology vastly more difficult; that the question of the origin of the Pueblos and the age of their decayed cities, and the use of some of their buildings, now magnificent ruins,